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NET MIGRATION IN UKRAINE: TIME-SERIES ANALYSIS AND FORECASTING

ABSTRACT

Migration has become a critical demographic and socio-economic issue for Ukraine, particularly in the context of large-scale displacement caused by the ongoing war. The objective of the study is to analyze and forecast net migration in order to provide an empirical basis for migration policy development and evidence-based government decision-making in Ukraine.

The paper analyzes annual net migration in Ukraine over the period 1960–2025 and produces a three-year forecast for 2026–2028. The analysis is based on annual net migration data obtained from the World Bank database. The empirical analysis employs an ARIMA time-series framework estimated in Stata software. According to the results, the negative 1960–2025 cumulative net-migration balance for Ukraine indicates population loss, caused by episodic shocks, primarily the 2022 full-scale invasion. Instead, conditional dynamic forecasts suggest positive net migration of approximately 0.84–0.99 million persons annually in 2026–2028, assuming that the estimated post-2022 structural shift persists. At the same time, relatively wide prediction intervals reflect the substantial uncertainty associated with forecasting migration after a major structural shock in 2022, which represents the largest disruption in the series. As a result, the generated forecasts provide a scenario-based empirical reference that may support migration policy planning in Ukraine. Policy makers should treat the forecasts as conditional and update plans continuously, as realized outcomes will depend on security, reconstruction, and reintegration efforts.

The study contributes to the existing literature by combining long-term historical net migration data analysis with relevant time-series forecasting techniques to assess potential migration trends in Ukraine, thereby advancing the broader discussion on migration processes in conflict-affected countries.

Keywords: migration, net migration, migration processes, time-series analysis, migration forecasting, forced displacement, war, Ukraine

JEL Classification: F22, C22, J61

INTRODUCTION

Migration has become a central demographic and socioeconomic process shaping population dynamics in Eastern Europe. In the case of Ukraine, migration flows have been strongly influenced by structural political and economic transformations. The full-scale invasion of Ukraine in 2022 produced one of the largest forced displacement crises in Europe in recent decades, leading to millions of cross-border refugee movements and large internal population shifts. Understanding the trajectory of migration processes is essential for designing effective migration, labor-market, and reconstruction policies. In this context, empirical forecasting of migration flows becomes an important analytical tool for evidence-based policymaking. Although forecasting migration in a post-conflict context is challenging due to high sensitivity to security conditions, it remains essential for informing strategic planning in labor markets, demographic policy, infrastructure development, and government decision-making.

LITERATURE REVIEW

The review examines recent scholarship on migration from Ukraine, policy responses in the EU and Ukraine, and the socioeconomic impacts on labor markets and regional development.

Libanova (2025) provides a systematic assessment of the number, composition, and return prospects of external war migrants from Ukraine, emphasizing that migration outcomes depend on family composition (presence of children, elderly members, or chronic illness), employment and housing losses, and the duration of the war. She warns that long stays abroad and labor market integration abroad will reduce return rates and thus amplify post-war human-capital losses. Kolomiyets and Goletc (2023) similarly document the unprecedented scale of migration after Russia's full-scale invasion on 24 February 2022 and stress that a growing share of initially temporary moves may become permanent if economic and security conditions in Ukraine do not improve. Such studies frame migration as both a humanitarian crisis and a structural demographic shock.

Several authors analyze consequences for both the Ukrainian and European labor markets. Rybchak et al. (2024) quantify the demographic tilt of migrants toward working ages (their sample shows a large share in ages 18–49) and project short-term relief for EU labor shortages but long-term negative effects for Ukraine's labor supply; they also present a three-year projection of migration volumes and call for coordinated financial support for labor-market restoration. Studies by Bobrova & Don (2023) and by Osipova & Hayetska (2024) document how large outflows create sectoral shortages, wage pressures, and skill mismatches. These works stress that international labor migration produces ambiguous effects: host countries may gain skilled workers and demographic relief, while origin economies suffer "brain drain" unless return or diaspora-engagement policies are implemented. Work focused on enterprise and personnel policy (e.g., Tsymbaliuk et al., 2023) highlights managerial adaptations (remote work, rotation, flexible schedules) as short-term retention tools; authors argue that firm-level measures are necessary complements to national policy.

A distinct literature examines host-country responses and the EU's legal framework. Guild & Groenendijk (2023) analyze the EU's activation of temporary protection (Directive 2001/55/EC) and conclude that rapid access to the labor market and education materially improved integration outcomes for beneficiaries, thereby demonstrating that political will and coordinated EU action can absorb very large inflows without system collapse. Kyselova (2023) and Pozniak (2023) examine legal terminology, the diversity of national asylum procedures, and debates about "double standards" in protection; they argue these debates will shape longer-term EU migration policy and public attitudes toward solidarity. At the national level, Primush & Nosachov (2025) and Korchevska & Morozova (2025) treat migration policy as a political science question, calling for institutional modernization, better coordination across ministries, and instruments that balance security, labor needs, and social equity.

The literature on internally displaced persons (IDPs) highlights acute institutional gaps. Voznyak, Savchuk, and Kaspshyshak (2023) document registration, housing, medical access, and employment mismatches that undermine IDP integration into host communities and slow adaptation; they recommend monitoring tools, improved registration/benefit mechanisms, and targeted employment measures. Bil (2022) situates forced migration within a framework of social vulnerability and warns that overly broad post-war recovery plans risk formalism unless targeted instruments reduce social vulnerability and channel migrants' remittances and acquired rights back into reintegration. Multi-author policy reviews (e.g., Chervinska et al., 2024) aggregate financial and managerial priorities–identifying funding gaps, reintegration incentives, and the need for differentiated strategies for IDPs, refugees, and labor migrants.

A recurring methodological theme is data quality and contradictory counts of migrants. Libanova (2025) and Pozniak (2023) both note the serious discrepancies between registration, border-crossing counts, and residency statistics, and how these discrepancies complicate forecasting and policy design. This motivates the mixed forecasting approaches used by Rybchak et al. (2024), who combine historical series (2013–2023) with scenario-based adjustments for war intensity and labor-market absorption capacity. Empirically, authors warn that model projections are highly sensitive to war duration, host-country labor demand, and integration policies – variables that must be made explicit in forecasting exercises.

Across the reviewed literature, three recurrent gaps emerge. The main observed gap is the scarcity of empirical work that produces quantitative migration forecasts. Our article addresses this gap by producing forecasts with 95% prediction intervals and linking the forecasts to policy needs. In this way, the study contributes an econometric forecasting approach that bridges quantitative measurement of migration flows and policy application. This positions our work to inform both scholarly debates and practical government decision-making and planning.

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AIMS AND OBJECTIVES

The objective of the study is to analyze and forecast net migration in order to provide an empirical basis for migration policy development and evidence-based government decision-making in Ukraine.

To achieve this objective, the following tasks were set and completed in the study:

- to examine the long-term dynamics of annual net migration in Ukraine over the period 1960–2025 and implement time series modelling;
- to generate forecasts of net migration for the period 2026–2028;
- to provide a reference for migration policy planning under conditions of post-war uncertainty.

METHODS

The analysis uses annual net migration for Ukraine from the World Bank time-series database, covering 1960–2025.

Net migration is the difference between the number of immigrants and emigrants in a given year (Glossary | DataBank, n.d.). Net migration aggregates all inflows and outflows reported in a single, internationally consistent series (permanent migration, refugee flows, and registrations). For policy makers and macro-planners concerned with demographic change and labor-market supply, a single annual net balance is a direct and widely used metric. This aggregate indicator from the World Bank was chosen primarily because it provides the longest comparable continuous annual record for Ukraine (beginning 1960), which enables estimation of long-run dynamics and structural change. However, we acknowledge that the indicator has several limitations. Specifically, during conflict periods, the series conflates temporary movements (short-term displacement, cross-border registrations) and more permanent migration.

Using the full available annual series (N = 66) during the period 1960–2025 yields its advantages. It captures long-run dynamics and secular trends that predate the war, which provides a sufficiently large sample for statistical estimation.

All estimation and diagnostics were performed in Stata. ARIMA was selected as the primary model for the analysis. ARIMA models are standard, well-understood tools for univariate forecasting when the goal is to project a single time series conditional on its own past behaviour and a small set of known interventions. In our case, structural events (the 2022 war shock) can be included as exogenous intervention dummies while preserving the time-series dynamics.

Model selection proceeded by exploring low-order ARIMA specifications and information criteria and by examining residual diagnostics. The final model estimates net migration in Ukraine (variable name: net_migration) on the full sample 1960–2025 (N = 66) and uses maximum likelihood estimation for the AR(1) parameter. The model reported as the main specification is an ARIMA(1,0,0) in levels (i.e., an AR(1) in levels) with two exogenous intervention dummies: a 2022 pulse (equal to 1 only in 2022) capturing the immediate one-off displacement effect, and a 2022 step (equal to 1 for 2022 and for all subsequent years) capturing a persistent level shift after 2022. The decision to estimate in levels (d = 0) rather than to differ the series was driven by the substantive aim to quantify level shifts and by the empirical finding that, once the intervention dummies are included, the AR(1) in levels adequately captured serial dependence. In other words, differencing would remove level information that is policy-relevant, specifically the magnitude of the 2022 displacement and any permanent change in the post-2022 baseline. Treating the 2022 wartime outflow as an explicit structural intervention preserves the substantive information contained in the 2022 observation and allows separation of an immediate shock (pulse) from a persistent change in mean level (step). This approach is preferred to excluding the 2022 observation, because exclusion would remove the event that the analysis aims to measure.

Dynamic forecasts for 2026–2028 are produced recursively from the estimated AR(1) with the maintained assumption that the estimated post-2022 step remains in force (i.e., d2022_step = 1 in forecast years). Point forecasts and Gaussian 95% prediction intervals are computed from the model mean square error and standard linear forecasting formulas.

In sum, the chosen methodology is an AR(1) (ARIMA(1,0,0)) in levels with explicit 2022 pulse and step intervention dummies, estimated on the full 1960–2025 annual World Bank series and validated with residual diagnostics and simulation-based forecast intervals. In the study, we report diagnostics, limitations, and suggested robustness checks. Forecasting net migration after a large structural shock (the war that began in 2022) is difficult, but such analysis is highly policy-relevant.

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RESULTS

We present the results of the time-series analysis of annual net migration for Ukraine covering 1960–2025 and the conditional three-year forecasts for 2026–2028.

If we look at Table 1, the cumulative migration balance stands at -2.5 million people. The empirical distribution of annual net migration is highly non-Gaussian. Skewness (−6.293) and kurtosis (50.002) indicate extreme left skew and heavy tails. The 2022 observation (−5,699,445) is a dominant structural value: it substantially influences higher moments (variance, skewness, kurtosis) and therefore the behaviour of standard statistical summaries. Given the substantive origin of the 2022 observation (wartime displacement), the series was modelled with explicit intervention variables rather than excluding or winsorising that observation.

Table 1. Descriptive statistics of net migration in Ukraine, 1960–2025. *(Source: calculated by the authors based on World Bank data)*

Statistic	Value
Observations	66
Mean	-37,421.68
Median	15,683
Std. Dev.	754,787.40
Minimum	-5,699,445 (2022)
Maximum	1,702,358 (2025)
Skewness	-6.293
Kurtosis	50.002
Summ	-2,469,831

Next, we select and report as the final model an ARIMA(1,0,0) in levels with two exogenous intervention dummies (d2022_pulse, d2022_step). The reported model is an autoregressive model of order one (AR(1)) estimated in levels with two exogenous binary regressors: d2022_pulse (equal to 1 only in 2022) and d2022_step (equal to 1 for 2022 and each subsequent year). Estimation used the full sample 1960–2025. The model was used for further dynamic forecasting from 2026.

Table 2. Estimated model (ARIMA(1,0,0) with interventions), sample 1960–2025 (N=66). *(Source: calculated by the authors based on World Bank data)*

Coefficient	Estimate	Std. Err.	z	p-value	95% CI
d2022_pulse	-6,326,484.00	171,052.50	-36.99	0	[-6,661,741; -5,991,227]
d2022_step	818,019.20	91,934.16	8.9	0	[637,831.5; 998,206.8]
Constant (_cons)	11,981.21	86,369.70	0.14	0.89	[-157,300.3; 181,262.7]
AR(1) L1.	0.1837351	0.0589557	3.12	0.002	[0.0681839; 0.2992862]
σ (model residual s.e.)	192,578.90	6,701.10	-	0	[179,444.9; 205,712.9]

First coefficient (d2022_pulse (estimate: −6.326 million)) represents a one-off, contemporaneous downward effect for the year 2022 relative to the baseline. Its magnitude is consistent with the observed 2022 value (−5.699 million) once the persistent step and AR dynamics are accounted for. The coefficient is estimated with a small relative standard error and is statistically different from zero at conventional levels ($p < 0.001$).

Next coefficient (d2022_step (estimate: +0.818 million) represents a persistent, level shift in net migration from 2022 onward. In the model, the post-2022 baseline level of net migration is higher by approximately 818,019 persons per year, holding other model components constant. The coefficient is statistically significant ($p < 0.001$). Interpreting this coefficient requires caution because it expresses a reduced-form, average level shift. It does not identify the specific mechanisms that produced the observed post-2022 outcomes.

The autoregressive coefficient (AR(1): 0.184) is positive and statistically significant, indicating modest persistence in annual net migration after accounting for interventions. The magnitude indicates a partial carry-over of the previous year's level into the current year.

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As for Intercept, the constant term is small relative to the intervention coefficients and is not statistically different from zero.

If we talk about residual diagnostics (model adequacy), the Portmanteau test (wntestq; Q(20): 12.437, p: 0.9002) indicates that, after fitting the AR(1) model with the two intervention dummies, there is no statistical evidence of remaining serial correlation in the model residuals – in plain terms, the model has captured the time-dependence structure that was detectable in the sample. This finding supports the use of the model for conditional forecasting (i.e., generating point forecasts and intervals given the model specification and the maintained assumptions about the intervention variables). However, because the full-sample distribution of the raw series is strongly non-normal due to the 2022 observation, and because heteroskedasticity (time-varying variance) is plausible around that event, standard Gaussian confidence (prediction) intervals may be too narrow or otherwise misleading. Therefore, the model can be used, but only with explicit caveats. Therefore, we report the forecasts as scenario-conditional, complementing Gaussian intervals with simulation or bootstrap intervals.

The forecasts in Table 3 are generated dynamically with realized data used through 2025 and recursive prediction from 2026. Prediction standard errors and 95% intervals are derived from the model mean square error and the standard formula for linear forecasts under the ARIMA specification.

Table 3. Point forecasts and 95% prediction intervals (conditional on model and step=1). *(Source: calculated by the authors based on World Bank data)*

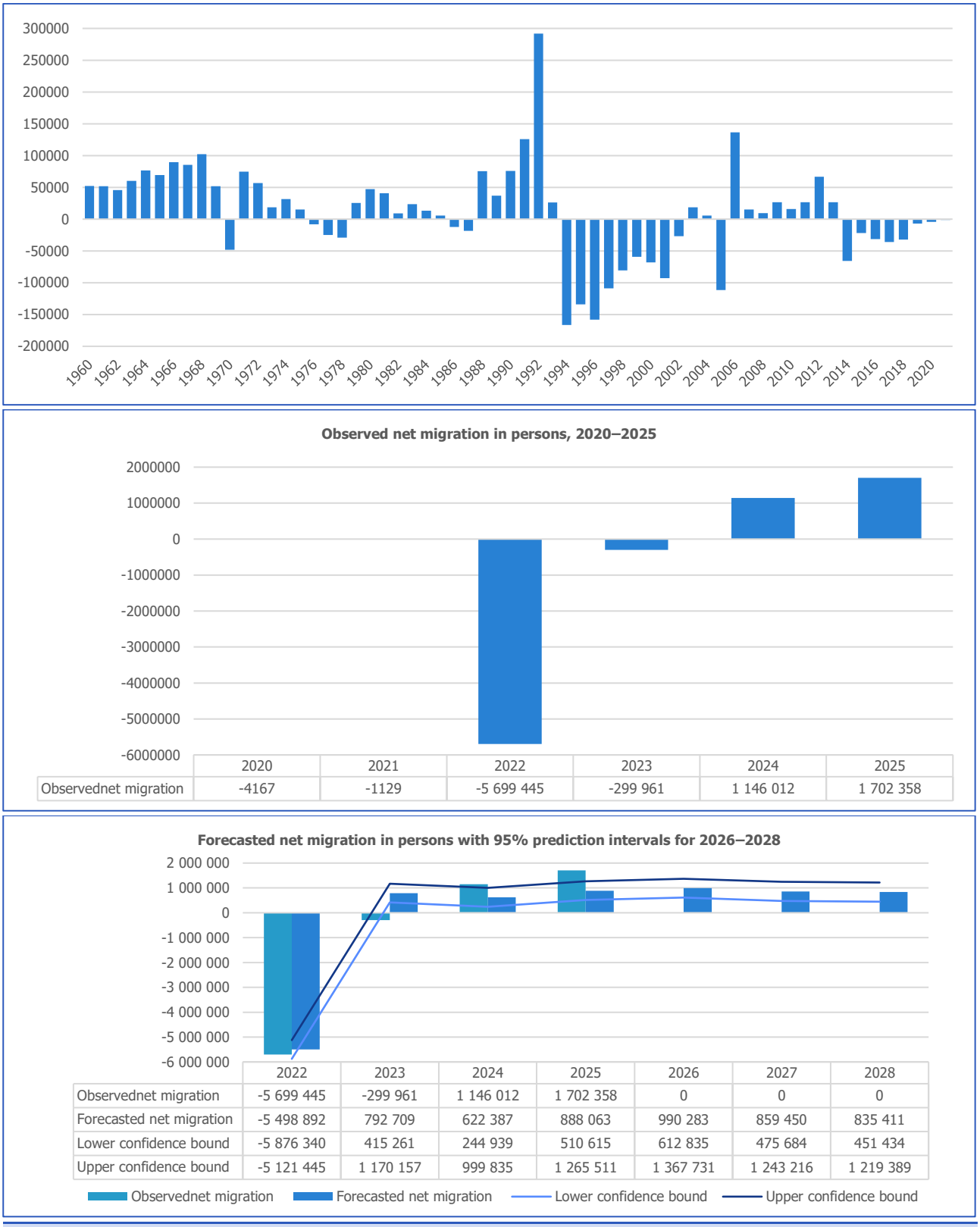
Year	Point forecast	95% lower	95% upper
2026	990,283.07	612,835.30	1,367,730.80
2027	859,449.93	475,683.99	1,243,215.90
2028	835,411.30	451,433.88	1,219,388.70

Under the maintained assumption that the estimated post-2022 level shift (d2022_step = 1) continues unchanged, the model produces positive point forecasts in the range 0.84–0.99 million net migrants per year for 2026–2028. These forecasts indicate that, if the post-2022 structural change continues in the same way, the model expects positive net migration of approximately 0.84–0.99 million persons per year during 2026–2028.

At the same time, the 95% prediction intervals are relatively wide (approximately ±0.38–0.43 million persons around the point forecasts), which reflects the magnitude of residual variability and the uncertainty that compounds in multi-step dynamic forecasting. It reflects the genuine uncertainty inherent in forecasting a series that recently experienced a very large structural shock. Confidence intervals provide a plausible range of outcomes under the maintained assumptions of the model. Wider intervals indicate that the model acknowledges this uncertainty instead of presenting overly precise estimates.

Figure 1 displays the full annual series of net migration for Ukraine (1960–2025) together with model-based point forecasts and 95% prediction intervals for 2026–2028.

Over the long run, the series exhibits a persistent pattern of net population loss, punctuated by episodic, historically traceable discontinuities. The largest discontinuities coincide with three distinct kinds of events: the administrative and definitional break after the USSR's dissolution (early 1990s), episodic registration or reclassification spikes (e.g., 1992, 2006), and conflict-driven forced displacement (2014, 2022). Sharp single-year spikes often reflect changed registration practice or one-off reclassifications rather than purely behavioural demographic change, since Soviet-era internal mobility became international only after 1991 (IOM, UN Migration, n.d.).The 2022 observation (net_migration: −5.7 million persons) is an extreme but coherent signal tied to the full-scale invasion of 24 February 2022; mass cross-border refugee movements produced a documented, multi-million outflow in the months that followed (World Bank, 2025); United Nations High Commissioner for Refugees (UNHCR, n.d.). Because net-migration aggregates border crossing and stock-change measures, conflict periods produce very large negative annual balances; different sources and definitions deliver somewhat different point counts, but all corroborate a multi-million 2022 outflow.



	2020	2021	2022	2023	2024	2025
Observednet migration	-4167	-1129	-5 699 445	-299 961	1 146 012	1 702 358

	2022	2023	2024	2025	2026	2027	2028
Observednet migration	-5 699 445	-299 961	1 146 012	1 702 358	0	0	0
Forecasted net migration	-5 498 892	792 709	622 387	888 063	990 283	859 450	835 411
Lower confidence bound	-5 876 340	415 261	244 939	510 615	612 835	475 684	451 434
Upper confidence bound	-5 121 445	1 170 157	999 835	1 265 511	1 367 731	1 243 216	1 219 389

Figure 1. Net migration in Ukraine: observed dynamics (1960–2025) and forecast (2026–2028). *(Source: calculated by the authors based on World Bank data)*

The post-2022 portion of the series shows large positive values in 2024 (+1.1 million persons) and 2025 (+1.7 million persons), with 2023 also exhibiting a substantial adjustment. International operational monitoring documents significant return movements and high levels of back-and-forth mobility during 2022–2025; multilaterally supported voluntary return and reintegration programmes were active and appear to have contributed to observed net inflows (International Organization for Migration (IOM, 2025; Ukraine returns report, 2025). These observed positive balances plausibly reflect a mixture

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of partial return migration of displaced Ukrainians, administrative updates and re-registration that reconcile previously recorded outflows, and some inflows of humanitarian and reconstruction personnel.

Two cautions are needed. First, the 2024–2025 positive magnitudes (especially the 2025 value of +1.7 million persons) must be triangulated with administrative population registers and country reports before being treated as durable, permanent repatriation: short-term border crossings, transit movements, and reclassification effects can appear as transient net inflows. Second, because the World Bank net-migration series conflates temporary and permanent moves, the series alone cannot distinguish whether returns represent long-term resettlement, short visits, or episodic circular mobility.

Taken together, we document a transition from extreme forced out-migration in 2022 toward a phase of substantial net returns in 2023–2025. The model forecasts (2026–2028) are conditional on the estimated post-2022 level shift and indicate continued positive net balances under that maintained assumption. Crucially, the magnitude and persistence of future inflows remain highly sensitive to security conditions, the pace of reconstruction and housing rehabilitation, labor-market opportunities, and the effectiveness of administrative reintegration – factors that lie outside the univariate AR(1) specification and that therefore require scenario interpretation and continuous empirical monitoring.

The 66-year cumulative negative balance (1960–2025) shows that migration has been a structural source of population loss for Ukraine, compounding natural decrease and affecting labor supply, pension systems, and regional population structures. Conflict shocks (notably 2014 and the full-scale invasion in 2022) dominate the recent series and demonstrate that migration trends can be sharply disrupted by episodes of forced displacement. Policy, therefore, must combine immediate humanitarian protection with reintegration incentives and long-term demographic and labor-market planning (Years After Crimea's Annexation, 2019). Protection and integration reporting highlight persistent barriers in employment, housing, and social protection that may slow or limit permanent returns (Situation Ukraine: Refugee situation, n.d.). At the same time, empirical monitoring supports the plausibility of substantial return movements. Operational displacement monitoring has documented millions of return movements and high levels of back-and-forth mobility (IOM, 2025).

The AR(1) model with a 2022 pulse and post-2022 step conducted in our research produces conditional forecasts of roughly 0.8–1.0 million net migrants per year for 2026–2028, under the maintained assumption that the estimated post-2022 level shift persists. In other words, the model assumes that the structural shift observed after 2022 persists at the same magnitude in the coming years. Under this assumption, the estimated model suggests a continuation of the relatively high net migration levels that appeared in the most recent observed years.

The value in 2022 is a documented high-magnitude wartime displacement and thus constitutes substantive information about the phenomenon under study rather than a measurement error. By retaining 2022 and representing it with an explicit pulse (one-off) dummy and a step (persistent) dummy, the model preserves relevant information about the event while allowing the estimation to accommodate a persistent change in mean level. This approach allows the analysis to estimate both the short-run shock and any change in the post-2022 baseline, which is analytically preferable for policy-relevant forecasting and interpretation than arbitrary exclusion. Excluding the observation would remove real, policy-relevant information. The detected structural shock in 2022 in our model aligns with the widely documented scale of forced migration caused by the full-scale Russian invasion. Several studies (Guild & Groenendijk, 2023; Kyselova, 2023) describe the war as the largest displacement crisis in Europe since World War II and highlight the rapid movement of millions of Ukrainians abroad.

If the structural conditions affecting migration change (for example, if the post-2022 level shift weakens or disappears), the actual migration outcomes may fall outside the predicted range of models' confidence intervals. For this reason, the forecasts should be interpreted as scenario-based estimates that are useful for analytical and planning purposes rather than unconditional predictions and must be updated as new data become available. The forecasts describe a possible future trajectory if the current post-2022 pattern remains stable. Given the extreme magnitude of the 2022 pulse and the short post-shock sample, the point forecast estimates in our research should be treated as optimistic but uncertain. Reporting alternative scenario variants and simulation-based intervals is recommended for policy audiences.

To translate model estimates into actionable planning, we propose three archetypal scenarios:

1. Optimistic reintegration (consistent with point forecasts): accelerated reconstruction, targeted housing and employment programmes, and strong international financial support lead to sustained returns and net inflows near model point estimates (0.8–1.4 million persons). This path aligns with high-return narratives in displacement monitoring and donor scenarios (Ukraine Crisis Response Plan 2026, 2026). On the other hand, Bil (2022) interprets post-2022 trends as indicating a low potential for large-scale rapid re-emigration and stresses the demographic catastrophe and high vulnerability that reduce return prospects. That view contrasts with the positive net balances

point forecasts we produced. Bil's reading underlines that if vulnerability and housing destruction persist, our optimistic point forecasts may be overly optimistic.

2. Stalled reintegration (mid-range or lower bound): returns continue, but many remain abroad due to insufficient housing, jobs, and services; this maps to the model's lower 95% bounds (0.4–0.8 million persons). Official reporting on integration constraints supports this cautious outcome (Situation Ukraine: Refugee situation, n.d.).

3. Re-displacement or slow-return (outside current model assumptions): renewed hostilities, major infrastructure shocks, or waning international support reverse gains and drive renewed outflows. This outcome lies outside the central conditional projection and would require immediate model revision; reconstruction and fiscal constraints make this scenario non-negligible (World Bank, 2026). Kolomiyets and Goletc (2023) highlight that temporary migration can become permanent, threatening long-term human-capital loss. This warns that statistically observed return movements in 2023–2025 could still be reversed or diluted over time as many migrants consolidate their lives abroad. That risk is captured in our "re-displacement or slow-return" scenario.

DISCUSSION

Libanova (2025) emphasises that return prospects depend heavily on war duration, housing and employment conditions, and the level of migrants' adaptation abroad. She warns that the longer the war and the more migrants become economically integrated abroad, the lower return rates will be. That reasoning supports our scenario framing and the claim that non-statistical external factors (housing, jobs, war duration) are essential.

If policymakers treat the conditional forecasts as planning inputs, the following priorities should guide policy and programming.

First, scale up housing restitution and rapid rehabilitation. The forecasted returns imply an urgent need for accelerated repair of damaged housing and expanded provisional shelter capacity so that temporary returns translate into durable resettlement; without rapid housing interventions, many return movements will remain transitory and fragile (World Bank, 2026).

Second, implement targeted labor-market reintegration and skills recognition. Returning individuals must be matched to reconstruction-relevant occupations, and systems for recognition of foreign-acquired qualifications should be streamlined to reduce the risk of secondary migration and to maximise the contribution of returnees to local labor markets (Situation Ukraine: Refugee situation, n.d.).

Third, secure coordinated finance and strengthen governance for returns. Predictable donor financing, clear administrative pathways for identity documents, benefits, and property claims, and capacity building for municipal and regional authorities are essential to convert forecasted inflows into sustainable reintegration; without such coordination, bottlenecks in benefits, property restitution, and service delivery will impede resettlement (European Commission, 2025).

Fourth, maintain dynamic monitoring and contingency planning. Authorities and partners should implement near-real-time monitoring of border flows, registration, housing occupancy, and labor-market indicators, and maintain contingency plans that can be triggered if observed flows depart from projections (Ukraine Crisis Response Plan 2026, 2026). The call of Primush and Nosachov (2025) to treat migration as a political research and policy object, and to keep migration policy adaptive and institutionally embedded, supports the recommendation that forecasts be used as a dynamically updated planning envelope alongside political/institutional measures.

Finally, integrate migration forecasts into fiscal and labor planning. Scenario-conditional forecasts should be used to size pension, health, and schooling liabilities and to plan sectoral workforce mobilisation for reconstruction so that public budgets and labor policies anticipate rather than react to large demographic shifts. Bobrova D. and Don (2023) document labour shortages in Ukraine and note that return migration could help fill gaps. This aligns with our points about the policy importance of labour-market measures to convert forecasted return flows into productive reintegration rather than temporary or permanent exit.

In sum, the time-series results are informative but conditional. They quantify a plausible medium-term trajectory under continued post-2022 conditions and thereby highlight the scale of policy action required to translate return migration into durable demographic and economic recovery. Major previous studies indicate that the same set of non-statistical drivers shape migration outcomes, including the security trajectory, housing reconstruction, labour-market opportunities, administrative and integration policies, and international financial support (Libanova, 2025; Guild & Groenendijk, 2023; Voznyak et al., 2023, and other similar studies). This evidence supports our interpretation that model forecasts should be treated

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as conditional on these external factors. Continued monitoring and timely policy responses will therefore be essential, as the realized trajectory will depend on political, security, and reconstruction developments.

CONCLUSIONS

The study aimed to analyze Ukraine's net migration and to produce its empirical forecasts in order to support evidence-based migration policy and government decision-making. Using annual data for 1960–2025, the analysis examined the long-term dynamics of net migration and estimated a time-series model to produce conditional forecasts for 2026–2028.

According to the results, the cumulative net-migration balance in Ukraine for the period 1960–2025 is negative, reflecting a steady population loss over the years. The estimated ARIMA(1,0,0) model with intervention dummies indicates three key features of Ukraine's migration dynamics. First, the 2022 pulse coefficient captures a large one-off negative shock consistent with the documented mass outflow of refugees. Second, the statistically significant step coefficient suggests a positive level shift in net migration after 2022, reflecting the observed transition from large outflows to substantial return movements during 2023–2025. Third, the autoregressive parameter indicates modest persistence in annual net migration flows, implying partial carry-over from one year to the next.

Conditional forecasts indicate positive net migration for the period 2026–2028, with point estimates in the range of approximately 0.84–0.99 million persons per year. However, prediction intervals remain wide, reflecting the uncertainty associated with recent structural shocks and the limited number of post-2022 observations. Consequently, the forecasts should be interpreted as scenario-conditional projections rather than unconditional predictions. They describe the expected trajectory if the post-2022 migration regime shift persists and no major new shocks occur.

Substantively, the projected positive balances are most plausibly explained by continued return migration of displaced Ukrainians, combined with administrative population adjustments and limited inflows related to humanitarian or reconstruction activities. At the same time, the persistence and scale of such inflows depend heavily on external conditions that lie beyond the statistical model, including security developments, the pace of housing reconstruction, labor-market opportunities, and the effectiveness of reintegration policies.

Overall, the study offers a transparent and reproducible approach to forecasting Ukraine's net migration. The model incorporates the structural shock of 2022 through intervention modeling and generates conditional medium-term forecasts suitable for analytical and policy planning. The results highlight a transition from extreme forced out-migration in 2022 toward a potential phase of net return migration. The analysis provides a transparent quantitative baseline for policy discussions, illustrating the possible magnitude of return flows under continued post-2022 conditions. For policy purposes, these projections are best used as a planning envelope that should be continuously updated as new migration data and information on reconstruction and security conditions become available.

The research preserves and models the 2022 structural shock. This retains the substantive wartime event in the estimation. However, the single dominating 2022 observation strongly influences higher moments and parameter estimates; although treated as an intervention, uncertainty about post-2022 dynamics remains high. The short post-shock sample (three observed post-2022 annual values) limits learning about evolving persistence and increases reliance on the maintained step assumption for out-of-sample forecasts. Further, the forecasts are conditional on the chosen statistical specification and the estimated parameters. They do not account for structural changes that the model cannot observe, such as new large-scale security shocks, abrupt host-country policy shifts, or other changes. Additionally, the World Bank net-migration series aggregates temporary crossings, short-term returns, and permanent resettlement into a single net balance measure. Therefore, large positive forecasts may reflect mobile or temporary returns rather than durable repatriation. Given these limitations, the forecasts are most useful as a scenario-conditional planning envelope rather than definitive predictions. Future research should extend the analysis by integrating economic and security indicators into multivariate forecasting models and distinguishing between temporary mobility and permanent return migration in order to improve the robustness and policy relevance of migration projections.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ЧИСТА МІГРАЦІЯ В УКРАЇНІ: АНАЛІЗ ЧАСОВИХ РЯДІВ І ПРОГНОЗУВАННЯ

Міграція стала критичним демографічним і соціально-економічним викликом для України, особливо в умовах масового переміщення населення, спричиненого війною. Мета дослідження – проаналізувати та спрогнозувати чистий міграційний рух в Україні для формування емпіричної бази як основи розроблення міграційної політики й обґрунтованого ухвалення рішень урядом країни.

У роботі проаналізовано щорічний показник чистої міграції в Україні за період 1960–2025 рр. і побудовано трирічний прогноз на 2026–2028 рр. Аналіз базується на щорічних даних про міграційний баланс України, отриманих із бази даних Світового банку. Емпіричний аналіз здійснено в рамках моделювання ARIMA для часових рядів у програмному забезпеченні Stata. Згідно з результатами, негативний кумулятивний баланс чистої міграції в Україні за період 1960–2025 років свідчить про скорочення населення, спричинене епізодичними стресами, перш за все повномасштабним уторгненням 2022 року. Натомість умовні динамічні прогнози припускають позитивний міграційний баланс приблизно 0,84–0,99 млн осіб протягом 2026–2028 рр. за умови збереження оціненого пост-2022 рівневого зсуву. Водночас відносно широкі прогнозні інтервали відображають суттєву невизначеність, пов'язану з прогнозуванням міграції після великого структурного шоку 2022 р., що є найбільшим порушенням у серії. Отож, отримані прогнози можуть слугувати сценарно орієнтованою емпіричною опорою для планування міграційної політики в Україні. При цьому радимо розглядати прогнози як умовні та регулярно оновлювати плани з урахуванням безпекових, реконструційних і реінтеграційних факторів.

Проведене дослідження робить внесок у наявну наукову літературу шляхом поєднання аналізу довгострокових історичних даних про чисту міграцію з актуальними методами прогнозування часових рядів для визначення потенційних міграційних тенденцій в Україні, тим самим збагачуючи наукову дискусію щодо міграційних процесів у країнах, які постраждали від збройних конфліктів.

Ключові слова: міграція, чиста міграція, міграційні процеси, аналіз часових рядів, прогнозування міграції, вимушене переселення, війна, Україна

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